

GEOLOGICAL SURVEY OF CANADA
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REPORT
ON THE
TOPOGRAPHY AND GEOLOGY
OF
GREAT BEAR LAKE
AND OF A
CHAIN OF LAKES AND STREAMS
THENCE TO
GREAT SLAVE LAKE

By
J. MACINTOSH BELL, M.A.



OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE KING'S MOST
EXCELLENT MAJESTY
1901

No. 725

ROBERT BELL, M.D., D.Sc., LL.D., F.R.S.

Director Geological Survey of Canada.

SIR,—I herewith beg to submit my report on the exploration during the seasons of 1899-1900, of Great Bear lake and of a chain of lakes and streams thence to Great Slave lake.

I have the honour to be, sir,

Your obedient servant,

J. MACINTOSH BELL.

OTTAWA, April, 1901.

REPORT
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TOPOGRAPHY AND GEOLOGY OF GREAT BEAR LAKE
AND OF

A Chain of Lakes and Streams thence to Great Slave Lake.

BY J. MACINTOSH BELL, M.A.,

1900.

The following report is based on work which was carried out around Great Bear lake and through the country thence to Great Slave lake, under the direction of Dr. Robert Bell, in connection with his explorations during the seasons of 1899-1900. In the summer of 1899, I acted as Dr. Bell's assistant, and worked along the north-west arm of Great Slave lake and later along its north-eastern and south-eastern shores. When Dr. Bell started south in September, he thought it advisable to leave me in the country in order to continue operations during the winter and the following summer. Accordingly arrangements were made for me to pass the winter with Mr. F. C. Gaudet, of the Hudson's Bay Company. During the cold months, trips were undertaken east and west of Slave river. ^{District examined.} Examinations were made of the Palaeozoic rocks in these directions. I had hoped to be able to examine the country around the head-waters of the Buffalo river, but when I received instructions from Ottawa by the Hudson's Bay Company's packet, it was already too late in the season to do any exploring south of Great Slave lake, and I devoted all my efforts in preparing to make my trip to Great Bear lake a success. My ^{Continuance of work during winter.} instructions directed that I should undertake a topographical and geological survey not only of Great Bear lake itself, but of the Indian canoe-route between that lake and Great Slave lake, together with as much as possible of the adjoining country. ^{Character of investigations.}

Having made careful inquiries from the Indians, as well as from ^{Best route to Great Bear lake.} other people cognizant of the facts, regarding the various routes to

Party leave
Fort
Resolution.

Great Bear lake, I decided that the best way thither was by the Mackenzie and Bear rivers, returning from Great Bear lake via Lac Ste. Croix and Lac la Martre. It will be apparent that this plan was the more feasible when it is mentioned that no supplies whatever could be obtained at Fort Rae, while there was a chance of obtaining a fair supply from the Hudson's Bay Company at Fort Simpson. Accordingly I left Fort Resolution on April 11th with two canoeemen, Charles Bunn and Louis Tremblay, and one dog team carrying my canoe and dunnage which was to go with us over Great Slave lake to Fort Providence. Another load with instruments and supplies had preceded us and we met the men and dogs returning while we were making the traverse of the lake. Unfortunately the condition of the snow upon the ice, owing to the mild weather, was such that we were able to travel only at night and even then with difficulty most of the time. The trip to Hay river that I had made in two days during the winter, now took us five. We did not reach Fort Providence till the 23rd. I may here take the opportunity of thanking the Rev. Mr. Marsh and the members of his mission for the hospitality which we received in passing through, and for the information he gave me concerning the northern country. I delayed at Fort Providence till the 28th, taking astronomical observations to compare with those made before at the same place by other observers.

Willow river.

Leaving Fort Providence we proceeded to the mouth of the Willow river, some 16 miles below, where we decided to wait till the ice broke up. The season was already far advanced, the willows were in blossom and the river was now unsafe for travel, so that I knew it was useless to proceed further by dog team. Willow river was a convenient place because the Hudson's Bay Company's steamer Wrigley was drawn up there, and I had been advised to take passage in her as far as Fort Simpson on account of the danger due to the ice at this time of the year, and moreover there was abundance of both fish and wild fowl there, and the food question is always an important matter in the north.

Exploration
of.

The ice on the Willow river broke up on the 6th of May and the Mackenzie on the 12th, but the Wrigley was unable to leave before the 21st. I therefore passed the intervening time in making short explorations up the Willow river. This stream, which joins the Mackenzie in latitude $61^{\circ} 22' 36''$, is interesting as being the route followed by the Indians of the Mackenzie. Near its junction with the Mackenzie the river is over 300 yards broad, but there its current is comparatively slow, it soon dwindles, however, to a rapid stream of 15 yards in width, but with a strong volume of water. For the first six miles the country is low and swampy and the margins are covered with willow and alder, but

Description of
country.

above this the banks reach 40 to 60 feet in height and the country in general becomes higher and better wooded. Exposures of till containing huge Archean boulders and overlaid by sand and silt, are common. In places prairie-plateaux already green at the time of our visit, sloped away from the river. At a distance of ten miles up, the stream becomes swift and broken, and according to the Indians, it is almost a continuous rapid from this point to Willow lake, near Mont à la Corne, although in low water, tracking is said to be good and navigation not very difficult.

The Wrigley reached Fort Simpson on the 21st of May, and I remained here a week to make ready our outfit for the summer's trip and to obtain more information concerning the Bear Lake country. We set out from Fort Simpson on the 28th of May in our own canoe, the swift current of the Mackenzie so materially aiding our paddles that we reached Fort Wrigley in a day and a half. At Rocher-qui-trempe-à-l'eau, about 30 miles below this port, we halted for a few days on our journey in order to make a short trip into the interior. The rocks of this mountain have been so well described by Mr. McConnell of the Geological Survey, that it is unnecessary for me to elaborate his account. Arriving at Fort Norman on the 3rd of June, we learned that Bear Lake river had broken up only the day before and that Indians coming down from Great Bear lake announced that travelling there or on the river would be quite impossible for three weeks to come. Here, therefore, I again occupied myself in making short trips into the interior and by rearranging my plans and outfit. At Fort Norman I engaged two more men, Charles Camell and John Sanderson, the former agreeing to help me as much as possible in scientific work and the latter to act as guide and interpreter around Great Bear lake.

Arrive at Fort Simpson.

Delayed at Fort Norman.

Additional assistance employed.

On the 21st of June, I left Fort Norman with my party of four and soon after entered the Bear river. At its mouth this stream is about 350 yards in width. Its clear waters join the Mackenzie through a deep wooded valley, which they have cut through the soft Tertiary strata. The deciduous trees were already in full leaf and the steeply sloping banks of the river were bright with hundreds of northern flowers. For the first 40 miles the physiography of the Bear river does not vary much. The banks are comparatively low, seldom exceeding 200 feet in height. They are well wooded with white spruce, canoe birch, aspen and balsam-poplar. Continual land slides on either side of the river, as a result of the eating away of the banks, have given the river-slopes a rough step-like appearance. The banks were at this time piled with ice to a height of twenty feet, sometimes stretch-

Bear river.

Timber.

Trend of valley.

Egg islands.

Ice makes navigation difficult.

Ascend Mount Charles.

View from summit.

Chain of lakes to the westward.

ing for miles along the shore. This made tracking especially difficult. The valley of the river for the first forty miles as far as the Egg islands, runs about 15° north of east and the river has a current of from three to four miles an hour. Its average width is over 200 yards. The high banks just described alternate with grassy swampy shores with scarcely any beach. The river was, however, very high and probably in low water gravel beaches are more or less common. At about forty-two miles above its mouth, the river widens to more than 400 yards to inclose the Egg islands, the largest of which is about one mile in length. These are alluvial islands, four in number, changing in size from year to year. At the time we passed they were completely covered with ice to a thickness of twenty and in places even thirty feet. Great pieces of ice kept breaking off from these masses causing huge waves to pass across the river, thus rendering navigation particularly difficult and we were often in danger of being swamped. Above the Egg islands, the upward course of the river soon enters that spur of the mountains which crosses the Mackenzie below Fort Simpson. Above this the rapidity of its current quickly increases, culminating in the canyon of the Bear river. Just below the rapid in the canyon, Mount Charles rises to a height of 1,500 feet on the left side of the river. This is the highest peak of the mountains in this vicinity. I delayed for an afternoon to ascend it, in order to study the geology and to obtain a view of the surrounding country. In climbing the hill I was surprised at the size of the trees around its lower slope. White spruce of about twenty inches in diameter were quite common, as well as fine specimens of canoe-birch, balsam-poplar and aspen. The sunny slopes were gay with flowers, many of which one might expect to find only in more southern latitudes. There was still a little snow on the summit, but for the most part, the hill was green and covered with shrubs. The view from the top was one of great beauty. Stretching to the horizon could be seen a wooded country thickly interspersed with lakes. Far away towards the south, Mount Clark stood out clear against the sky. It was connected with the mountain on which I stood by a line of low rugged limestone hills which continued on towards the north in the direction of the Mackenzie. To the westward lay the valley of the great Mackenzie, and nearer in the landscape was a chain of large lakes parallel to this stream, and having an outlet through the Willow river into the Bear river. A small deep river which drained the country to the northward could be seen to enter the Bear almost at the foot of Mount Charles. To the north-eastward was the deep depression of Great Bear lake. Continuing our way up the river, we soon entered the canyon with an easily navigable rapid,

but my men had some difficulty in tracking our canoes past it owing to the steepness of the banks. There is a portage on the north side which is used by the Indians, when the water is too high to permit of tracking along the shore. They also use it to carry part of the loads in order to lighten their canoes when heavily laden. For two or three miles (which is the length of the canyon) the banks of the river are very steep and from 150 to 200 feet in height. The river has here cut itself a deep channel through the soft cretaceous strata. Soon after passing above the rapid, the banks become sloping and less wooded. Cut-banks of sand and gravel were sometimes observed, but as a rule the shores were low and swampy.

Description of canyon.

We reached Great Bear lake on June 23rd and were disappointed to find that the ice on its surface was still intact, so that we were obliged to pitch our camp on the south side near the outlet. Here we waited till July 4th, when the lake was sufficiently clear of ice to allow us to proceed along the north shore. The country around the outlet is particularly dreary. It is an old camping ground of the Indians who gather here in winter for the fishing, which is good throughout the season, as the current is swift and the water remains open during the whole winter. The country hereabouts is quite destitute of trees, as they have all been used for fuel by the Indians. The low swampy shore-line continues to the southward in an immense muskeg which is said to stretch some twenty-five miles into the interior or towards the south-west.

Camp at Great Bear lake.

Several short trips were made into the interior along the south shore while we were waiting at the head of the river, but they failed to give much information either of topographical or geological interest. Some three or four miles along the south shore the trees reappear and continue as far as we could see. Shoals occur all along this shore and make it exceedingly difficult to obtain landing places.

Trips made into the interior.

While encamped at the head of the Bear river, we were visited by a band of Hareskin natives who came under the leadership of an Indian who at first appeared to be very unfriendly. He wanted to know whence we had come and what was our reason for being there. He said that he wished us to understand that we were to kill no caribou, as, if the white man went among them they would all surely disappear. However, after considerable exchange of conversation he realized that our intentions were friendly, and he became quite cordial, telling us where most of the caribou were to be found and where the best fishing places were, and, as a last consideration he agreed to meet us about the middle of August in MacTavish bay, and to send

Visited by Indians.

Engage one as guide.

Hareskin and
Dogrib
Indians.

one of his band to guide us thence southward to Great Slave lake. The Hareskin and Dogrib Indians are, for the most part, a harmless and good natured race, living on the fish they catch or the deer they kill. As a rule they travel at least once a year to trade with the Hudson's Bay Company either at Fort Rae or Fort Norman. They are, as yet, but little civilized, although the majority of them have recently been christianized by the Oblate fathers. They are rather a handsome people being tall and well built and their picturesque deer-skin coats, ornamented with beads and porcupine quills, give them a pleasing appearance.

Visit site of
Fort Franklin.

Leaving our camp on the south side of the outlet we crossed to the site of Fort Franklin. The timber of this building had been used to warm the wigwams of the Indians and all that remained to mark its situation, were a few piles of stones where the fireplaces had been. At this place a small river enters the lake and is known to the Indians as Grey Goose river which flows from a lake of the same name, and other lakes farther to the north. Near these lakes, another river takes its rise and flows towards Smith bay. The canoe-route thus formed is used by the Indians in travelling from Smith bay to Keith bay, when the ice of Great Bear lake prevents them from following the lake shore. Keith bay, the most western part of Great Bear lake, stretches eastward towards Cape Etta and Gros Cap. The north-western shore of Keith bay is broken by two deep indentations. The most westerly I called Russel bay, and the other and deeper Richardson bay. Following the northern shore of Keith bay is a range of low sandy hills, never exceeding 500 feet in height. For the most part, these hills are at a distance of from three to four miles back from the lake shore, but in several places they touch the water's edge. Whiskeyjack hill is a rounded elevation near the shore, about thirteen miles from the head of the Bear river. The hills follow the immediate shore-line to the south-west of Richardson bay. The whole northern shore of Keith bay, including Russel and Richardson bays is low, but easy of approach. A fine sandy beach, replaced in some parts by gravel and boulders, is prolonged at the point in long narrow bars, sometimes of extraordinary shape and strewn with immense erratics. Two small rivers enter the foot of Russel bay. The most northerly, the Salatreil, a very small stream, has cut itself a deep winding channel through the great stretches of sand which occur there. Another river enters the western extremity of Richardson bay. We reached this point on July 12th, having been delayed several times by the ice and in each case I made short trips into the interior.

Canoe-route
to Keith bay.

Physiography
of country.

From Richardson bay we decided that it was best to follow an old Indian canoe-route commencing at the river above mentioned across the Gros Cap peninsula to Smith bay, rather than attempt to follow round the north shore of Richardson bay with the chance of being again delayed by the ice, which was still packed around Gros Cap. The western extremity of Richardson bay is low and swampy and the river which enters it has only a very slight current. We followed this up for about 2 miles and here it had dwindled to a small stream flowing from the north-west. At this distance, after searching for some time, we discovered a portage about half a mile long, which brought us into a small lake, less than three-quarters of a mile in length, from which a portage of a few hundred yards took us into a small muskeg lake. Having left the ice behind us at Richardson bay, I was astonished to find the lake filled with pond lilies, *Nuphar advena* (?), in flower, especially as this is rather a late summer flower about Ottawa. It is quite possible that it may have been *Nuphar polysephalum*, as the flower seemed rather too large for the other species. From this lake, a portage of 150 yards brought us into one of less than two miles in length, whence a portage of a quarter of a mile carried us into Lac des Maringuoins, a beautiful stretch of brown-coloured water about five miles in length by three miles in width. Its shores were well wooded with white spruce, willows and alders, but none of them of great size. Here I saw the most northern specimen of white birch on the north-west side of Great Bear lake. To the west of Lac des Maringuoins there is a short range of sandy hills.

Route from Richardson bay.

Lake filled with water lilies.

Lac des Maringuoins.

Leaving this lake we entered a small river flowing from its northern end, which we followed till we arrived at Ice-bound bay, the most southern portion of Smith bay. It is not more than 8 or 9 miles in a straight line from Lac des Maringuoins to Ice-bound bay, but the river is shallow, rapid and exceedingly crooked, which gave us much trouble in navigating it. Its bed is often almost blocked by large Laurentian boulders, so large in fact that in several places I was almost convinced I had discovered an outcrop of these rocks in situ. In one part, the stream widens into a small lake, from which hundreds of ducks and other waterfowl rose as we passed along. The stream teemed with whitefish, passing up from the cold waters of Ice-bound bay to the warmer water of the inland lakes. Reaching Ice-bound bay on July 16th, we were surprised to find the bay filled with ice. A strong north wind kept the ice against the shore and prevented our moving until July 21st. We therefore fixed our camp in a good place in order to examine thoroughly the surrounding country.

Laurentian boulders.

Delayed by ice.

View from
Knife hill.

A bluff of sand and sandstone overlaid with boulder clays, known as Knife hill, came to the water's edge at the north-west point of the bay. This hill is about 500 feet high and from its summit a splendid view was obtained, not only of the surrounding country, but also of the northern shore of Smith bay and the islands in the lake. To the south and south-west could be seen an elevated rolling sandy country, having small lakes with wooded shores in the valleys and becoming almost mountainous far away on the horizon. To the east lay the Sweet Grass hills, stretching off towards Gros Cap. Being high and having steep cut-banks of white sand, I supposed at first they might be partly covered with snow, but closer observation showed their true character. To the north lay high hills on the northern shore of Smith bay, which could be seen to rise higher farther away, and then to disappear in the north-western horizon. To the east and west lay the water of Smith bay, vanishing in either direction at the sky line. Westward its extent is much greater than hitherto supposed, but at the time of our visit this part of the lake was completely jammed with floating ice, so that we were unable to go into it at all.

Smith bay
sighted.

Journey
continued
through ice.

When, at last, the wind changed on July 21st and allowed us to proceed, it was only by breaking our way through the ice for 4 miles that we were able to reach open water. From this point we were no more troubled with ice, and were glad to leave behind what had been so great an obstacle to our progress. A long traverse across an open stretch of water is always a dangerous undertaking, and my men did not like to risk the straight traverse to the north shore of Smith bay, which was nearly 18 miles. We preferred to go somewhat out of our way in order to pass by Treeless island which lay about half way across and almost directly north of Knife point and hill at a distance of about 7 miles. Treeless island is a low wind-swept spot of land, roughly triangular in shape, being about $2\frac{1}{2}$ miles long by $1\frac{1}{2}$ miles wide at its base. Its greatest height is about 100 feet and from this part of the island I was able to obtain good bearings along the southern shore of Smith bay. Treeless island thoroughly deserves its name. It is quite treeless but supports a few stunted specimens of willow brush *Salix glauca* and *S. speciosa*.

Treeless
island.

Reach
Smith bay.

A traverse of thirteen miles, in a direction a little east of north, brought us from Treeless island to the north shore of Smith bay near the mouth of a river which we ascended for two or three miles. I was unable to find out anything of interest about this stream, but it seems to have cut for itself a deep valley through the range of rounded wooded hills which lie to the north of this part of Smith bay, some

six or seven miles back from the shore. This is probably the Katseyedie river of Père Petitot's map, and if it is this stream, its source is in a large lake to the north called Petitot lake or Lac des Bois. We were delayed by wind and rain near its mouth, and I made several short excursions into the surrounding country. Between the hills and the lake is a low rolling tract with many ponds and muskegs. The low country is almost devoid of timber of any kind, and in fact from this point onward till we neared Fort Confidence we saw very few trees indeed, and these were small in the trunk and stunted in height. After leaving the Katseyedie river, the shores for some distance are sandy. Low battures extend out into the lake, sometimes completely separating stretches of water from the lake, and often being cut off from the mainland so as to form gravelly or sandy islands, the home of hundreds of gulls and wild fowl. Low uninteresting shores extend to within thirty miles of Fort Confidence. The beach is strewn with huge glacial erratics. Shoals are so common that landing places are found with difficulty and in many sections the shores are so flat and swampy that we could not get a camping place. The hills, which were mentioned before as being north of the mouth of the Katseyedie river, follow along the north shore of Dease bay for about fifty miles, when they gradually decrease in height and disappear. At the same time behind these hills, but at a distance of ten to fifteen miles back from the shore, a new range becomes prominent. These are much higher and bolder in outline. They approach to within ten miles of the shore, about sixty miles east of the Katseyedie river and follow it for some six or seven miles, when they bend more to the north, and finally disappear against the horizon. It was a pleasing change from the cheerless, gravelly, treeless shores to reach Limestone point with its pronounced shore-line and with white spruce in the bay behind. Limestone point is about ninety miles east of the mouth of the Katseyedie river, and about thirty miles west of Fort Confidence. From this onward, the general appearance of the country becomes completely changed. High rocky banks following the immediate shore-line replace the swampy or gravelly shores which had prevailed for some distance.

Katseyedie river.

Timber, scarce.

Erratics.

Prominent range of hills.

Natural features improve.

We reached old Fort Confidence on the last day of July and pitched our camp in order to make explorations into the country around. It was at this post that Sir John Richardson and Dr. Rae with Messrs. Dease and Simpson wintered in their search for Sir John Franklin in the middle of the century. We were surprised to find the log houses of the fort still in good condition, although nearly half a century had elapsed since their occupation, more especially as not even the chimneys

Fort Confidence.

Buildings still in good condition.

Flowers
abundant.

were standing of Fort Franklin at the head of the Bear river. Not a single nail had been used in the buildings at Fort Confidence, but skillful dove-tailing had given them both neatness and durability. The fort is situated in a sheltered place, protected by a big island. Its location is one of the few well-wooded spots on Great Bear lake and the trees are fine specimens, worthy of a more southern latitude. The ground had been free from snow for some weeks and *Papaver Arctica*, *Lupinus Arcticus*, and many other northern flowers, which mature quickly at this season of perpetual sunlight, brightened the mossy hill-sides with colour. The park-like appearance of this far northern spot was indeed refreshing after the dreary country we had passed through since leaving the mouth of Bear river.

Object of trip
into Barren
Land.

After having placed our provisions, etc., *en cache* on a small rocky island near the mouth of the Dease river, we started on August 1st on a trip into the Barren Land. Our object was to reach the Coppermine river, or at least to learn something of the geology and geography of the country intervening between it and Great Bear lake. Our trip lasted some 10 days, and before turning back we saw the waters of the Coppermine at a point which I supposed to be about 15 or 20 miles from its mouth. Our general course from the mouth of the Dease to the Coppermine was about 15° north of east, but often great deviations to either side were made to avoid high hills, lakes or other natural barriers. We followed the valley of the Dease for the first 35 miles and fording its two eastern branches crossed the height of land and reached the headwaters of the Happy river, a tributary of the Coppermine, from which we cut across country to the main stream.

Route
followed.

Coppermine
river reached.

Distance from
Great Bear
lake to
Coppermine
river.
Description of
country.

The distance traversed between Great Bear lake and the Coppermine was approximately 60 miles, although it is very likely that in part of its course the Coppermine approaches somewhat nearer to Great Bear lake. For the first 15 miles the country is comparatively flat, thickly interspersed with lakes and well or fairly well wooded with spruce. Beyond this the region is a succession of hills and valleys with practically no timber. Willows, however, were seen at several favourable localities and fair-sized, though rather "scraggy" specimens of white spruce were observed on the Happy river. The Coppermine itself is said to be wooded to within 25 miles of its mouth. After crossing the Happy river, the country becomes almost mountainous; and boldly outlined and lofty hills rise in every direction. The hills seem to be grouped in ranges which run almost north and south. They are not of great altitude, the highest seldom reaching more than 800 feet above the plain below. The country is a particularly difficult one to pass over, the valleys are low and swampy and covered with

Difficulties of
travel.

"têtes-de-femmes," and any one who has tried to walk through a country covered with these little hummocks will be able to appreciate our difficulties. You soon become tired out by endeavouring to step the unequal distances between these mounds of grass; you plunge violently and are at every few steps knee-deep in the ice-cold muck and phagnum between them. Then after leaving the swampy valleys, the slopes were strewn with small angular bits of stone from the hills above, which was anything but a pleasing change when walking with wet and tired feet.

The Coppermine river, where we saw it, is a fine large stream with an even current of about 3 miles an hour, and over a quarter of a mile in width. Lofty rounded or mammillated hills rise on its opposite side and it seems to lose itself among similar hills in the direction of the sea. Its tributary, the Happy river, is not a large stream, and would be navigable for canoes with some difficulty, although I believe both the Indians and the Eskimos use it for navigation.

Coppermine river and tributary.

The Dease river too is not of any considerable size, being less than 100 yards in breadth at its mouth. It is moreover exceedingly rapid and is not a feasible route for canoes passing up stream. It is formed by the union of two branches: the northerly, and larger branch, flowing from the north, while the south branch is formed by the union of two streams which drain the country to the south-west. The immediate valley of the main part of the Dease is rocky throughout its course. The country between it and the Coppermine is particularly dreary and desolate. It is thickly strewn with lakes some of which are of considerable size. Returning from the Coppermine, we sketched the shores of a lake which I supposed to be the one aptly named by Sir John Richardson, Dismal lake. Certainly nothing could be more dismal than the wind-swept treeless shores of this northern lake in the heart of the Barren Lands and in a drizzling snow-storm, as was our experience when we visited it.

Dease river described.

Return to Fort Confidence.

Near Dismal lake we fell in with a party of Eskimos who ran from us as we approached, in spite of all our efforts to retain them. They had evidently learned from their forefathers of the murderous treatment which their people had received from Herne and his followers when exploring the Coppermine and expected the same from us. But as a matter of fact, even had we been bloodthirstily inclined, we would have put up a poor fight, as we were all quite tired out. Their camp was a most extraordinary place and it would be hard to imagine a more uncomfortable situation. It lay almost on the shore of Dismal lake with a pond in the rear. A hillock was capped by three or four

Party of Eskimos seen.

Their camp.

Caribou
plentiful.

huts. The walls were of flat stones placed on edge and the roofs were made of caribou skins. In the middle of the camp was a pile of raw caribou meat which the Eskimos are in the habit of laying by in the time of plenty. We waited some time at their camp, hoping they would return, but they did not do so. The caribou were grazing on the Barren Lands in vast herds and musk-oxen were also seen, so that there was no necessity for them to return to the food-supply at their camp. We were evidently the first white men they had seen, as not a single article of white man's manufacture was found in their camp.

Return
journey
commenced
Aug. 13th.

We left Fort Confidence, near the mouth of the Dease, on August 13th, and started on our return journey along the southern shore of Dease bay. A large island, nearly 12 miles in length and covered with rocky hills, almost fills the north-east end of Dease bay. This island is known to the Indians as Nelu-wera-nelue. Good weather favoured us till we rounded Cape Macdonnel, the promontory between Dease and MacTavish bays, which we reached on the 15th. For the first 30 miles, or as far as the Narakay islands, the southern shore of Dease bay is rough and rocky. Low broken hills follow the immediate shore and extend into the interior. Deep bays with wooded shores and small rocky islets are common.

Narakay
islands.

Description
of.

The Narakay islands themselves, of which there are seven or eight, are a prominent feature in the topography of this part of the lake. They are high and rocky and all present steep shores of greenstone to the water's edge. They lie about two miles off the mainland and can be seen distinctly for miles in either direction. After passing the Narakay islands, the country becomes low and swampy and assumes the uninteresting character of the north shore of the bay. The scenery shows great stretches of treeless tundra unbroken except for mounds of gravel or banks of sand. Low swampy islands with shallow pebbly shores lie off the gravel points, rendering navigation difficult near shore. It would be hard to imagine a more dreary landscape than that around Cape Macdonnel. The cape itself is a long narrow gravel point, strewn with immense Archæan boulders, stretching far out into the lake, and to the north east and east are the dark and gloomy shores of Dease and MacTavish bays. The shore-line of MacTavish bay, east of Cape Macdonnel, is for the first fifty miles a repetition of the south shore of Dease bay, with the exception that perhaps the mainland is somewhat higher and better wooded. The approach to the shore is even more difficult than in Dease bay and the submerged beach extends fully 200 yards from the shore before dropping ten feet. Some forty-five miles east of Cape Macdonnel a good sized river enters, probably the Takaatcho

MacTavish
and Dease
bays.

River supposed
to be the
Takaatcho.

of Petitot, although it is rather difficult to correlate the two. Near its mouth we found great quantities of driftwood, among which were some good sized trunks. I was rather surprised to see these, but learned afterwards that in the interior the valley of this river is well wooded.

Soon after passing the mouth of the Takaatcho river, the country becomes rocky and hilly, and some ten miles beyond the river, the hills come to the water's edge. Among them is a steep angular knob of greenstone, called Black rock which rises to a height of 600 feet. It receives its name from the dark colour of the rock of which it is composed. The shore-line of MacTavish bay, which runs almost straight east from Cape MacDonnel, after passing Black rock turns to the north-east and north for about fifteen miles, whence it trends southward and south-westward to enclose Eda Travers bay, and from this bay onward the shore-line is much cut up and indented. Deep fiords run far into the interior of the country and narrow unexpected channels separate rocky islands from the mainland. The extreme south-eastern part of the lake is known as Klarondesh bay, a deep arm stretching towards the east-south-east and cut off from the main portion of MacTavish bay by a high rocky island, over 13 miles in length, called by the Indians Ndutchio island. The channels separating it from the mainland are so narrow that we at first doubted their existence and considered the western shore of the island to be the mainland east of MacTavish bay.

Trend of
shore line
MacTavish
bay.

The whole eastern shores of MacTavish bay, including Klarondesh bay and Eda Travers bay, is surrounded by high hills of granite and greenstone. For miles along some parts of the shore these hills rise almost perpendicularly from the water's edge to a height of 600 and 700 feet. Occasionally we had difficulty in finding a landing place, but as a rule, sheltered harbours were found in which the scenery was usually very fine. The high rocky walls were stained and weathered to beautiful shades of purple, red and brown, and gave, with the reflection of the precipitous cliffs in the clear northern waters, a singularly rich effect. I climbed several high hills along the eastern shore of Eda Travers bay and was able to get a good view of the country to the eastward. As far as the eye could reach stretched hill after hill, lake after lake, and forest after forest. On a large scale or in a general way the country would best be described as high, rough and broken. The hills were not associated in ranges, and the country has the general appearance of an elevated peneplain. Separate mountains are, as a rule, conical in shape, but often the greenstone hills ended

Hills of
granite and
greenstone.

Birdseye view
of country.

abruptly in steep mural precipices, relieved by talus slopes. The highest hills at the shore do not exceed 800 feet in height, but they are probably higher in the interior. Around Klarondesh bay, the country is similar to that farther north although it is not so elevated.

Timber
possibly of
economic
value.

All the eastern shore of MacTavish bay is wooded. In the valleys in the interior and around the bays and sheltered channels, this timber may be of economic importance. White spruce is the prevailing forest tree, although canoe-birch is found as far north as Eda Travers bay and is sufficiently large in Klarondesh bay to permit of its bark being used for making canoes. Tamarac and both balsam-poplar and aspen abound in Klarondesh bay, although they are not of any great size.

Reached mouth
of Camsell
river.

Indian guide
disappointed
us.

We reached the mouth of the Camsell river, which enters the southern part of Klarondesh bay, about eighteen miles east of the south end of Ndutcho island, on the 24th of August, which was the agreed place of rendezvous for the Indians, but we were disappointed to find that they had already left for their hunting grounds, and we had no prospect before us but to start across country without a guide through an unknown region, all the way to Great Slave lake.

Trip across
country to
Great Slave
lake difficult.

It was too late in the year to attempt to follow around the shore of Great Bear lake and take the route across country by way of Lac le Marre, so we decided to attempt the one by Lac St. Croix which began with the Camsell river. This route was said to be the more difficult but the shorter of the two. The trip across country without a guide did not prove an easy one, and we often had great difficulty in getting along.

Camsell river.

The Camsell river has, at its mouth, a small island which divides the channel into two. The total width of the stream is about 100 yards. The current at the mouth is so strong that it may almost be termed a rapid, but it soon lessens, and at less than half a mile above the mouth, the river forms an expansion called Rainy lake. This lake which is only six miles in length is surrounded by low mammillated hills, which are wooded to the water's edge. At the eastern end of Rainy lake, the Camsell river enters with a short rapid, having a total drop of about four feet. It is ordinarily passed by a portage of a few steps on the eastern bank, but the water was too high and we were obliged to make a portage of about 100 yards on the opposite shore. Above this rapid the valley of the river turns abruptly to the north for about two miles and then it bends south. Just above this stretch is another short rapid, having a drop of five feet. Here there is a portage on the east bank, but it is used only in high water. Less

than half a mile above this is the White Eagle fall, the roar of which can be heard distinctly at Great Bear lake, on a calm day. White Eagle fall is more correctly a cascade of almost a quarter of a mile in length, the total drop being less than fifty feet. Here the river flows over syenite rocks. The scenery about the falls, with the blue hills rising in the background and the foaming river below is particularly pretty.

At the White Eagle fall, we were obliged to cut our own portage-road through the woods from the foot of the bay east of the falls to the slack water above. We had some difficulty in doing this, as the trees stood thickly together and were of considerable size. The portage is about 600 yards in length, partly over rough rocky ground and partly through a swamp. The country now ceased to be mountainous, but isolated rounded hills were to be seen on every side. Passing on up the river, we came to another chute about three miles south-east of White Eagle fall. Here the drop was about ten feet and the obstruction is passed by a portage of a few steps on the west bank. Soon after passing this rapid, we emerged upon a beautiful lake, which I supposed to be the Lac Clut of Pere Petitot. It is not a large lake, being about six miles long by as many wide, and its area is greatly diminished by a large island which fills the centre of the lake. To the east of Lac Clut runs a low range of hills which continues on towards the south-west.

Leaving Lac Clut at a point towards its south-western extremity, a short stretch of river brought us into another lake, which I have named Lac Grouard. It is a narrow lake about sixteen miles in length, but its greatest breadth does not reach three miles. A few miles up it divides in two, one arm stretching towards the south and the other towards the south-west. So far our course had been easy, but here we were in a dilemma as to which way to go. I climbed the highest hills in the neighbourhood but could not see the valley of the river in either direction. After considerable discussion, we finally decided to follow the way towards the south-west and were disappointed on reaching its south-western extremity to find no river. Later we learned that the Camsell river enters the southern bay, but as a matter of fact the river is here seldom used by the Indians, as it is exceedingly rapid and chance really took us in the right direction, for after searching around for some time we discovered a trail leading to another lake, not a quarter of a mile distant from Lac Grouard. This lake, I at first took to be a small one, but afterwards found out that what I then considered to be the whole lake was in reality merely the most north-

Lake Hottah easterly bay of the largest lake on our course. It is much resorted to by the Indians in winter and is named by them Lake Hottah (Two year old Moose lake). Lake Hottah is a magnificent stretch of beautiful clear water. Its maze of rocky tree-covered islands rivals those of the St. Lawrence in beauty. To the east and south-east conical hills rise to a height of 800 feet from a comparatively low level country and to the south-west runs a low range of mountains, which are said to stretch almost to MacVicar bay of Great Bear lake. Lake Hottah is about forty miles in length from north to south, and is in places over ten miles in width. It has its outlet from the north-western end, towards MacVicar bay and a large river draining the country to the south-westward enters the lake on its western side. Its maze of islands made it exceedingly difficult to survey, and on account of the great width it was only by climbing hills that I was able to sketch in the contours of the western shore or the opposite one from that along which I was passing.

Islands
make survey
difficult.

Lake Stairs. From the south-eastern extremity of Hottah Lake, a portage of 175 yards brought us into Lake Stairs, and we were again in the waters of the Camshell river, but unfortunately in passing along the lake we missed the river which flows into it and up which we intended to go, and before we knew of our mistake we were at the foot of the lake and there we found the river flowing out of it. A trip was made to a high hill in the interior and from it we discovered that the river flowed into the lake from a bay about half way down. We were, therefore, obliged to return that far. Lake Stairs is about nine miles in length and less than four miles in its greatest breadth. Entering the river from Lake Stairs, we found that it had diminished very much in volume since we had last seen it, being now little more than forty yards wide.

Beaver Lodge lake. Some three miles above Lake Stairs, it flows out of Beaver Lodge lake. This sheet of water has roughly the outline of a dumb-bell, having two large extremities and a narrow central portion. At the narrows are two conical hills in the form of a beaver's house and these give the lake its name. To the north of Beaver Lodge lake and between it and Lake Stairs runs a low ridge of rocky hills.

Lac Malfait. We left Beaver Lodge lake at its north-eastern extremity and after paddling a mile and a half against a sluggish current entered Lac Malfait, which has a most extraordinary form. Its shore-line is more broken than that of any other lake I have ever seen. Deep bays stretch in every direction and numerous islands with narrow channels between them divide the water into smaller lakes. Although it is really a small lake, we searched a whole afternoon in trying to find the

river which flows into it, but without success, and we afterwards learned that it enters the lake very near to its discharge. After we were almost in despair as to how we should get out of the lake, we discovered a portage of about half a mile long near the eastern end leading over a sandy moraine through a beautifully wooded tract to another lake, which stretched off towards the south. The latter, which I called Lake Isabella, is about seven miles in length. Towards its south-western end there is a ridge of low hills with even outline which seems to be a continuation of those seen south-west of Lake Hottah. These hills, from their form appear to consist of Palaeozoic rocks, while all the hills to the eastward, judging from their rounded appearance, would seem to be of Archæan origin. Leaving Lake Isabella, we made three short portages with two small lakes between them, before we again reached a sheet of water of notable size.

Portage to
Lake Isabella.

The first considerable lake we came to was the one I supposed, from its position, to be Lac Ste. Croix, mentioned by Père Petitot. It is a lake, so filled with islands and channels, that I was only able to obtain a rough idea of its size and to make a very indifferent track-survey of it. The Cammell River is said to flow from the northern end of this lake and to enter Lake Isabella near the portage, but we did not see it. Lac Ste. Croix is about sixteen miles in length, and is probably seven miles in width. We made a portage of a few steps from its south-west end to leave it, but we afterwards learned that this was not necessary and that the Indians usually follow the south-eastern shore and pass up the Cammell river into the next lake called Lac Rey, which is marked as lying to the south of Lac Ste. Croix. The country around Lac Rey is low and uninteresting with numerous grassy swamps near the water's edge. It is about seven miles in length and lies almost east-and-west. Its shores are well wooded. Here I noticed the Banksian pine for the first time in going south. We experienced some difficulty in finding our way out of Lac Rey, but at last discovered the Cammell river entering it with a small chute at its eastern extremity. Just above this chute, we came into a narrow lake about nine miles long, lying almost north-east and south-west. High rounded hills lie to the east of it and they seem to belong to the low range which was seen before towards the south-west. Here again we had difficulty in finding our way out. Naturally we passed right to the south-eastern end and here found the river flowing in. But just above the entrance it divided into two, one branch flowing from the south-west and the other and larger branch from the south. We followed the latter up through a small expansion and soon came to a rapid where we were disappointed to find that no Indians had passed

Lac Ste. Croix

Route difficult
to find.

that way lately and there were no signs of a portage-trail at the rapid. We had come the wrong way and were again obliged to turn back.

In order to save time, I went to the top of a high hill which lay near the lake and from it I saw a string of lakes stretching off towards the south-east from the southern end of Lac Fabre. This was near a place where we had seen some old Indian camps. Going to it, we found a portage-trail leading to a small lake about 300 yards from Lac Fabre. On paddling to the end of this small lake, we easily found a portage leading into another lake about two miles in length, whence a rough hilly portage led us into a rather large lake, which I have called Lake Rogers. This is a very pretty sheet of water filled with numerous tree-covered islands and bounded to the south-west by low wooded hills. Lake Rogers is almost twelve miles in length. The Cam-sell river enters it by two mouths at its north-east end and leaves it with a rapid about half way down its western shore.

Track survey made.

Here again we missed our way and lost nearly a whole day by going to the foot of Lake Rogers, whereas we should have left it very near the place where we entered it. But owing to having made this mistake I was able to get a complete track-survey of the lake and I also saw something of the country to the south-west of it, as I made an excursion into the interior from that end, hoping to find the portage out of the lake. The sheltered channels of Lake Rogers were filled with yellow pond lilies and potamogetons. Passing up the Cam-sell river from Lake Rogers, we were obliged to make a short portage around the Duck falls, some two or three miles to the north-east of Lake Rogers, and above these we entered Lake Grant. To the north of Lake Grant are high rounded hills, a continuation of those seen on Lac Fabre. Lake Grant has its greatest length (a little over six miles) from east to west. The Cam-sell river flows into it at its extreme eastern end, but between it and Lake Rosamond, which is the next lake, the river is too rapid to be followed and a portage is made into a bay of Lake Rosamond, which approaches to within a quarter of a mile of Lake Grant.

Lake Grant.

Good portage-trail found.

Here we were surprised to find a broad and well used portage-trail, after the poorly cut portages we had heretofore passed over, but we afterwards learned that we had so far been following a mere hunting trail, the regular route to Lake Rosamond from the north coming farther to the east of Lac Ste. Croix, and from the north-east end of Lac Fabre it strikes directly to Lake Grant. Lake Rosamond lies also north and south. It is over twelve miles long and like most of the northern lakes, it is much divided into bays and is filled with

islands and has an exceedingly intricate shore-line. To the east of the lake runs a range of high mammillated hills, whose direction is almost north and south. To the west a single mound-like hill rises to a height of 1,000 feet. A country thickly wooded with aspen, balsam-poplar, canoe-birch, white spruce and Banksian pine stretches to the south-west of Lake Rosamond. The Camsell river enters the lake at its extreme southern end, but being very rapid, it is not followed to the next lake south of it.

Hills east
of lake
Rosamond.

At Lake Rosamond we were fortunate enough to fall in with a party of Dogrib Indians, three of whom I engaged to guide us to Fort Rae. It was a great relief for me to meet these Indians. We had hitherto lost a great deal of valuable time in searching for portages and in endeavouring to find our way southward. Moreover, as the season was already far advanced, we never knew when we might have to stop and wait until the ice formed upon the lakes. We had also long been without regular provisions and were leading a hand-to-mouth existence, depending entirely upon the proceeds of our nets and rifles.

Dogrib Indian
engaged as
guide.

Leaving Lake Rosamond, we avoided the Camsell river and followed, instead, a route of three short portages with two small lakes between, which brought us into Tenika-Dawaso-necka lake or Small Rats' House lake. This lake, with the exception of Lake Hottah, was much the largest lake which we saw on our journey through the country. It is a magnificent sheet of beautiful clear water, nearly twenty miles in length and almost half as wide. The hills which follow the eastern shore of Lake Rosamond are continued along the eastern shore of Dawaso-necka lake at some distance to the south-east of it. The most prominent peak of these hills, which lies towards the northern end, gives the lake its name from its conical shape. This peak rises to a height of over 1,000 feet and is a striking feature in the landscape. The eastern shore of Dawaso-necka lake is thickly studded with islands, many of which, being high and rocky, give to the lake scenery a particularly pleasing effect. Leaving Dawaso-necka lake at its south-eastern end we entered a small rapid a few yards in width and on account of the small size of the stream we had some difficulty in making the few miles which intervened between Dawaso-necka lake and Lake Sarahk. Our P terboro canoe was too large for the stream and we often required to lift it out of the water in order to pass the shallowest parts. Lake Sarahk is about eight miles in length from north to south. Rounded rocky knobs follow its eastern shore, but tree-covered hills rise to the south-west. Lake Sarahk is said to be the source of the Camsell river.

Tenika-
Dawaso-necka
lake.

Lake Sarahk.

Height of
land passed.

Passing out of it we made four portages, with small muskeg lakes between them, in order to cross the height of land into Nagle lake, from which the water flows towards Great Slave lake. Nagle lake is not the source of the western branch of the Marian river, as the waters of the last two small lakes on the height-of-land flow towards the south.

Marian river
and lake.

We continued our journey without interruption down the Marian river to the lake of the same name, which is eighteen miles long by ten miles wide. In 1899, acting on Dr. Bell's instructions, I had made a track survey of this fine body of water and in passing through it on the present occasion I added numerous details to this work and made some other improvements. The lake discharges into the head of the Fort Rae arm of Great Slave lake by the Willow river, a sluggish stream only two miles in length.

Cross Great
Slave lake.

We reached Fort Rae on September 20th, and after paddling down the Arm to the main body of Great Slave lake, we crossed the latter in our canoe, going from island to island, although it was a hazardous undertaking at that time of the year, and arrived at Fort Resolution on the 29th. Without loss of time we continued our journey by canoe up Slave river to Fort Chippewyan on Athabasca lake. As canoe navigation was now closing, we remained at this post until ice had formed of sufficient strength for safe travelling up the Athabasca river, which was not until November 14th. On that date we started for Edmonton and arrived there on December 7th, and reached Ottawa on the 12th.

Edmonton
reached.

Acknowledg-
ments due.

While engaged in the above work, a helpful spirit was manifested by everyone I met in my journeys, so that it would be difficult to enumerate here all the kindness I received, but special acknowledgment is due to Mr. F. C. Gaudet, in whose house at Fort Resolution I spent the winter, to Chief Factor J. S. Camsell, in charge of Fort Simpson when I passed down the McKenzie river, to Messrs. Hislop and Nagle and to the various Catholic and Protestant missionaries throughout the country.

The following general account of the geology of the region surveyed or explored appeared in my Summary Report on the above work:

GEOLOGY.

Geology.

The south-western portion of Great Bear lake, known as Keith bay, together with Smith bay and Dease bay to within thirty miles of

Fort Confidence, are surrounded by unaltered and almost horizontal Cretaceous strata. There are few outcrops of solid rocks, but shales and sandstones are exposed along Smith bay, and the Sweet Grass hills represent a low anticlinal fold, composed of hard sandstone, which acts as the backbone of the Gros Cap peninsula. Clay-shales, boulder-clays, gravels and unconsolidated sandstone are exposed at various places within the Cretaceous area and these all show a bedding which is almost horizontal. Presumably Cretaceous rocks are also exposed along the shore of MacTavish bay, east of Cape MacDonnel. On the Bear river, the Bear River Tertiary, similar to that already described by Mr. McConnell, at Fort Norman, extends some seven or eight miles up the river, and consists chiefly of unaltered and slightly consolidated sandstones in horizontal beds. Arenaceous shale and thin lignite seams are occasionally interstratified. The beds are often overlain by boulder-clay and cut sand-banks are common. Beyond the Tertiary basin, Cretaceous rocks extend to "The Rapid," where a rocky range of Palaeozoic strata, crosses the river. Above this, there are frequent exposures of Cretaceous rocks, with some fossils almost as far as Great Bear lake. Here they consist chiefly of dark ferruginous and arenaceous shales overlain by thin-bedded and jointed light-yellow sandstones. Talus slopes are common. The beds dip down-stream at a very slight angle. It is from a stratigraphical and lithological comparison with the rocks of Bear river, that the rocks of Great Bear lake are referred to the Cretaceous, as nowhere on the lake were fossils found. On the upper part of Bear river are horizontal gravel beds of sixty and seventy feet in thickness, overlain by Pleistocene deposits. These gravel beds are probably analogous to those beds of the Mackenzie river which Mr. McConnell there calls Saskatchewan gravels. They are exposed at several places in the Cretaceous area.

Cretaceous
rocks.

Bear River
Tertiary.

Beds
analogous to
Saskatchewan
gravels.

' Ordovician or possibly Silurian rocks occur at "The Rapid" on the Bear river where the mountain range crosses it. Mount Charles, the most prominent part of these mountains, is a hill of about 1,500 feet in height, and consists of a large anticline, embracing subordinate folds. The rocks are interstratified conglomerates, quartzites and magnesian limestones; the latter of great thickness. I found thin layers of gypsum in several places, interstratified with dark-gray, shaly dolomite. Salt springs are mentioned by Sir John Franklin as occurring here, but I was unable to locate them, and my Indian guide had never heard of their existence, although some thirty miles to the north-westward he knew of salt in quantity. From the description given by Richardson, it is probable that the promontory between MacVicar

Rock possibly
Silurian.

Existence of
salt springs
not confirmed

and Keith bays is Devonian, though I think from what the Indians say, Cretaceous rocks must occur there also.

Paleozoic
boundary
seen.

'Our route to Great Slave lake from Great Bear lake, lay not far east of the Paleozoic boundary, as could be seen by the outline of the hills to the westward, and at the head-waters of the Marian river; and at Nagle lake, the limestone rocks came to the water's edge. From this vicinity, however, the strike seems to be almost south, while our course was south-east, so that we did not see Paleozoic rocks again, till we arrived at Lake Marian.

Lower
Cambrian
rocks.

'From a point about thirty miles south-west of the mouth of the Dease river, eastward, exposures of solid rocks occur which are analogous to rocks seen last year on Great Slave lake, and there referred by Dr. Bell to the Animikie or Lower Cambrian. A low range of hills follows the shore of Dease bay for a considerable distance, and gradually approaches the lake-shore, till it terminates at a place called by Richardson, Limestone point, some twenty miles from Fort Confidence. The hills seem to be a series of anticlinal folds running almost parallel to Dease bay. Limestone point at its greatest height does not exceed one hundred feet. The lowest exposures are of purplish dolomite, which changes to a ferruginous slate. Above this comes gray, semi-crystalline dolomite, associated with light-gray quartzite. Rocks of like nature occur all the way to the Coppermine river, though isolated and small hills of both granite and syenite occur, which may be of different age. Along the Dease river the rocks consist chiefly of bright-red quartzite and drab and red magnesian limestones. Nearer the Coppermine, quartz-conglomerates, red and green shales, and pinkish sandstones are the prevailing country rocks. Amygdaloid is, however, found, together with some earthy volcanic rocks. In a range of hills running north-east and south-west, probably a spur of the Copper mountains, occur thick intrusive sheets of greenstone, frequently presenting steep mural precipices on either side. These hills rise to a height of about 1,000 feet. Greenstone rocks are also met with, near the mouth of the Dease river. Rocks similar to these occur for a considerable distance around the northern and north-eastern portion of MacTavish bay, and here greenstone intrusions with mural precipices, cutting through horizontal Lower Cambrian strata, are of common occurrence.

Hills of
intrusive
greenstone.

'The eastern part of MacTavish bay is composed of a series of basic rocks, or greenstones, that seem to overlies the Laurentian granites, of which, however, exposures are seen at several places. The southern part of MacTavish bay and the islands there, are mostly of granite,

though greenstone dykes are common. Crystalline rocks, composed chiefly of porphyries, syenites and granites, with numerous greenstone intrusive sheets, occur all the way from Great Bear lake to Lake Marian. Hornblende gneiss is exposed on the Marian river. Certain rocks, met with near the headwaters of the Camsett river and near Lake Marian, may be referred to the Huronian system, or possibly they may be analogous to those met with on Great Slave lake, and named by Dr. Bell, the Intermediate series.

Area of crystalline rocks.

With regard to the occurrence of copper ores in the Great Bear lake country, I may say that in the amygdaloid and associated rocks near the Coppermine, specimens of chalcopyrite and stains of copper carbonate were found, but the locality of native copper, etc., spoken of by the old explorers was not met with, as it probably lies farther south. In the greenstones, east of MacTavish bay, occur numerous interrupted stringers of calc-spar, containing chalcopyrite and the steep rocky shores which here present themselves to the lake are often stained with cobalt-bloom and copper-green. According to Indian report, native copper occurs also at the north-east end of MacTavish bay. Siderite was found in pockets, in quartz and calc-spar in Siderite. Cambrian rocks on the southern shore of Dease bay. Several other minerals seem to be connected with it. Iron ore in the form of reniform hematite, was found, but in uncertain quantity at Rocher Rouge on Edatravers bay, in the north-eastern part of MacTavish bay. Hematite also occurs near the Coppermine river and at several localities on the east shore of MacTavish bay. Here the ore is associated with what seems to be a dark-reddish trap, which I was unable to identify more precisely in the field. Talus slopes of the ore and country rock are common.

Occurrence of native copper not confirmed.

Iron ore.

Evidences of glaciation, in the form of numerous glacial erratics were everywhere visible from the mouth of the Bear river, but it was not till the harder rocks of the Lower Cambrian were met with that glacial striae were seen. The general course of the striation is a little north of astronomical west, though great local differences occur. On the barren lands near Dease river, I noticed glacial striae in a direction N. 85° W. and fainter markings almost exactly at right angles. As Great Slave lake was approached, the course of striation seemed to be much more southward. Rows of drumlins, some of them three or four hundred feet in height, and long winding eskers were seen near the head-waters of the Dease river, and near Disual lake, kames occur.

Glaciation.

Recent ice
deposits.

Shore-lines on
Great Bear
lake.

'Modern ice deposits are seen on the Bear river and are being annually added to by the ice freezing to the bottom around the shallow shores of Bear lake, and in the spring the ice rises and carries away pebbles, sand, and sometimes even boulders of good size. Around Great Bear lake wonderful examples of old shore lines occur, showing the former extent of the lake. On the north-west side they exceed, in places, three hundred feet in height, and are at a distance of three to four miles back from the lake shore. This height on the north is much greater than any observed on the southern side, which might show a tilting of the lake towards the south or south-west. Besides these, broad beaches of one hundred to one hundred and fifty yards were often met with, and in places terraces of pebbles, showing old shore lines, extend for a short distance from the present shore of the lake, at various heights of from ten to one hundred feet. These are especially common in the northern part of MacTavish bay.'

APPENDIX

DESCRIPTIONS BY DR. A. E. BARLOW, OF ROCKS COLLECTED IN 1900,
BY J. MACINTOSH BELL, M. A., IN GREAT BEAR LAKE
DISTRICT AND THENCE TO GREAT SLAVE LAKE.

1. Mount Charles, Great Bear river.

A fossil coral—*Halysites catenularia* (Fischer) var. *gracilis* (Hall).

This fossil is distinctive of the Galena-Trenton formation in the west. It occurs abundantly around Lake Winnipeg. Further north Mr. J. B. Tyrrell obtained a specimen (loose) at Church-hill harbour. The same variety is characteristic of the Hudson River formation in Ontario (see page 69, Report on Corals by Mr. Lawrence Lambe). The above locality on Great Bear river therefore indicates a north-western extension of the Galena formation.

2. Great Bear lake, five miles S.W. of Limestone point. Quartzite grit.

A deep flesh-red rock with more or less rounded individuals of grayish translucent quartz.

Under the microscope the rock is seen to be made up largely at least of quartz, now for the most part forming an interlocking mosaic. The individuals of quartz differ greatly in size, but the larger ones are imbedded in a matrix relatively less in quantity, consisting of much smaller grains of quartz, together with a comparatively large amount of iron oxide. Felspar is either rare or entirely absent. The original clastic character of the rock is beyond a doubt as the outlines of the old and worn grains are still plainly discernible owing to the presence of films of iron oxide on the surface of these nuclear fragments. The eminently vitreous character of the rock is occasioned by the very complete infiltration of the secondary interstitial silica or cement in optical continuity with the original quartz fragments. It would be difficult to secure a more typical or characteristic example of this secondary enlargement of the quartz, so frequent in rocks of fragmental origin.

3. Great Bear lake, mouth of Dease river. Diabase.

A dark-greenish eruptive rock in which the ophitic structure may be seen by the unaided eye.

Much of the plagioclase is fairly fresh and the twinning lamellation is as a rule quite apparent. The tabular or lath-shaped individuals with well marked interlacing structure pierce allotriomorphic areas made up largely of calcite and serpentine, representing the original bisilicate material. Some of the plagioclase is altered chiefly to scapolite. Some scales of biotite may occasionally be noticed. Irregular grains and skeleton octahedral crystals of titaniferous magnetite are rather abundant.

4. Great Bear lake district, south shore Dease bay.

A brownish-gray fragmental rock.

The rock is very much decomposed and portions of it are abundantly stained with iron hydroxide. The thin section shows an association chiefly of calcite and quartz with irregular individuals of pyrite. It is probably some decomposed rock of tufaceous origin.

5. South shore of Dease bay, Great Bear lake district.

The hand specimen shows a yellowish-brown and greenish fragmental rock.

Under the microscope more or less rounded fragments of volcanic rocks together with much smaller individuals of quartz are embedded in a matrix made up chiefly of calcite. The volcanic fragments include various glassy and sometimes cellular leaves with small indefinite lath-shaped crystals of feldspar. It is a pyroclastic rock, probably a porphyrite tuff.

6. Black rock, Great Bear lake.

A massive, medium-grained, dark greenish-gray eruptive rock. The thin section shows a diabase with somewhat coarse ophitic structure.

The tabular crystals of plagioclase, most of which have undergone advanced saussuritization pierce the irregular individuals of pale-coloured augite. Many of the augite crystals are twins and some show incipient alteration to brownish-green compact hornblende. Areas of greenish serpentine are rather abundant. Grains and imperfect crystals of iron ore, probably titaniferous magnetite also occur.

7. Mouth of Camsell river.

Porphyry.

The hand specimen shows a pale-reddish very fine-grained rock with small spots of some greenish mineral.

The thin section shows a fine-grained microgranitic ground mass in which are embedded phenocrysts of decomposed felspar.

Areas of a greenish decomposition product occur. Sericite is abundant and some larger individuals of quartz.

8. Great Bear lake district, 5 miles south of Dismal lake.

A reddish granitoid rock.

Biotite-granite or granite.

The rock is made up of a crystalline granular admixture chiefly of orthoclase quartz and plagioclase. The biotite has been wholly converted into a deep green chlorite. The plagioclase is much more altered than the orthoclase, but both by their turbidity are in marked contrast to the quartz. The quartz shows undulous extinction as a result of strain. A little iron ore probably magnetite is present. Some calcite present in association with some of the chlorite suggests the presence of original hornblende.

9. Cache island, mouth of Dease river.

A dark greenish-gray comparatively coarse-grained eruptive rock.

Diorite.

The thin section shows the rock to be made up chiefly of plagioclase and hornblende. The plagioclase has undergone somewhat advanced saussuritization, but the twinning lamellation is still plainly discernible in places. The hornblende is prevailingly green with often a brownish tint, and some portions and individuals are of a decided brownish colour. Apatite is rather abundant in comparatively large prismatic forms. Iron ore probably titaniferous magnetite is abundant in irregular grains, and imperfect skeleton, octahedral crystals.

10. South-east shore, Lake Rosamond.

A flesh-red comparatively coarse-grained porphyritic granite. The thin section shows a crystalline admixture of microcline, microperthite, plagioclase, quartz and biotite which has been almost wholly converted into chlorite. The felspar shows partial alteration, especially the plagioclase, but some of the microcline is quite fresh. Occasional rather large imperfect prisms of

zircon were noticed. Ilmenite altered to leucoxene and iron hydroxide are often associated with the chlorite. Small prisms of apatite likewise occur.

11. Windy bay, Great Bear lake.

A very fine-grained, mottled greenish and red cherty rock. The thin section shows a decomposed ground-mass in some places very fine grained and stained reddish by iron hydroxide, while in others it has become more or less devitrified with accompanying decomposition, and is now made up of indefinite lath-shaped crystals largely replaced by chlorite. In this ground-mass are embedded phenocrysts of feldspar which have undergone rather advanced alteration. Magnetite is present in irregular grains. This rock is closely related to No. 12 and is probably a portion very poor in phenocrysts.

12. Echo bay, Great Bear lake.

A dark reddish-brown porphyritic rock

The thin sections show a microfelsitic ground-mass, which is in part replaced by chlorite and other decomposition products in which is embedded irregular phenocrysts of orthoclase, plagioclase, microperthite and quartz. The rock is a quartz porphyry which has undergone considerable alteration.

13. North shore of McTavish bay, Great Bear lake.

A greyish comparatively coarse-grained granitic rock. The thin section shows a biotite-granite or granite. It is composed of orthoclase, plagioclase, microcline, microperthite and quartz with a smaller proportion of biotite which has been wholly converted into chlorite. The plagioclase has undergone advanced alteration and forms the pale-yellowish grains seen in the hand specimen. It is replaced now largely by scales and plates of sericite together with a much smaller proportion of calcite. The other feldspars are quite fresh.

14. Echo bay, Great Bear lake.

A dark-grey porphyritic rock.

The thin section shows a porphyrite. The ground-mass varies in texture from microgranitic to microfelsitic, with a rather large proportion of green chloritic decomposition product. In this are embedded phenocrysts of plagioclase, some of which are largely altered to calcite. Irregular spaces are now occupied by what is apparently secondary quartz and calcite. Magnetite is rather abundant in irregular grains and occasional octahedral crystals.

15. Five miles north of mouth of Camsell river.

A dark-brownish porphyritic rock.

Porphyrite.

The thin section shows a reddish-brown for the most part isotropic ground-mass in which are embedded phenocrysts of plagioclase. The ground-mass has a striking perlitic structure, decomposition taking place along the cracks. Considerable areas of greenish decomposition product occur. Magnetite is present in irregular grains.

16. Three miles south of mouth of Camsell river.

Porphyrite.

A dark-brownish gray porphyritic rock.

The thin section shows a microgranitic ground-mass with a considerable amount of chlorite, in which are developed tabular phenocrysts of plagioclase. Considerable areas of chlorite occur, which doubtless represent the original bisilicate mineral.

17. Echo bay, Great Bear lake.

A dark-gray porphyritic rock.

The thin section shows a porphyrite. The ground mass is micro-felsitic, often decomposed with the formation of secondary sericite and calcite, and with very abundantly disseminated grains and dust-like particles of magnetite. It is also stained in places by iron hydroxide. In this are embedded phenocrysts of felspar, probably plagioclase. This is so much decomposed that the twinning striae are obliterated, but the character and disposition of the secondary scales and plates of calcite and sericite show that most of the porphyritic individuals are plagioclase.

18. Echo bay, Great Bear lake.

A fine-grained reddish jaspery rock.

The thin section shows a fine-grained rock consisting essentially of quartz together with a comparatively large proportion of hematite. It appears to be an acid lava which has undergone advanced devitrification. There is a marked spherulitic structure with separating areas of holocrystalline material, the whole intimately penetrated by minute beautifully dendritic forms of hematite. A little calcite was noticed in irregular grains.

19. North end of Hottah lake.

A dark-greenish gray, massive, eruptive rock with a reddish tint owing to the abundance of disseminated deep-reddish crystals of feldspar.

The thin section shows a diorite made up chiefly of greenish, strongly pleochroic hornblende in irregular individuals and feldspar, most of which at least is presumably plagioclase much decomposed and stained by iron hydroxide. A little orthoclase is present, and quartz for the most part in association with feldspar forming areas of granophyre which fill up irregular interspaces between the other constituents. Magnetite is abundant and pyrite is also present.

20. Middle of Hottah lake, Great Bear lake.

A dark-greenish, somewhat coarse, basic eruptive rock, in which a rude ophitic structure is plainly discernible.

The thin section shows an association of tabular crystals of decomposed plagioclase, penetrating allotromorphic masses of green strongly trichroic green hornblende. A large amount of ilmenite almost completely altered to leucoxene occurs, as well as long acicular prisms of apatite. The rock is a uraltic diabase.

21. Five miles south of Big point, Great Bear lake.

A dark-gray porphyritic rock.

The rock is evidently a hypabassal form of the porphyrite approaching the so-called propylite of Hungary and Western America. Some portions of the rock present a distinct and decided although comparatively coarse ground-mass with phenocrysts chiefly of plagioclase and areas of chlorite. In other places no sharp line exists between the phenocrysts and ground-mass and the rock shows a disposition to assume the holocrystalline structure. The magnetite is abundant in irregular grains, while occasional plates of biotite occur. The rock is much decomposed and traversed by veins of chlorite and calcite. (Occasional irregular plates of altered biotite).

22. Middle of Lake Manai.

A pale reddish-grey compact arkose.

The thin section shows irregularly often angular, subangular, or rounded grains of orthoclase, plagioclase, microcline and quartz, together with small scales and plates of biotite, most of which has undergone more or less complete chloritization. These are

closely compacted together with little or no finer interstitial material. A little magnetite is also present.

(Plagioclase, microcline, magnetite).

23. Four miles south of Poplar point, Manai river.

A fine-grained compact brownish rock.

The thin section shows a fine-grained arkose made up of angular or slightly rounded grains of orthoclase, plagioclase and quartz closely compacted together. The felspars, which are very abundant, are much altered and stained with iron hydroxide. The rock has undergone considerable decomposition and chlorite is abundantly disseminated.

24. Fourth of six falls, Manai river.

A coarse reddish basic granitoid rock.

The thin section shows a hornblende-biotite-granite or hornblende-granitoid made up chiefly of orthoclase, plagioclase, microcline and quartz, together with hornblende and biotite. Most of the felspars, especially the microcline are fresh, but some of the plagioclase shows incipient decomposition. A little epidote, occasional small prisms of zircon and irregular grains of magnetite are also present.

25. Ten miles south of Poplar point, Manai river.

A dark-gray porphyritic rock.

The thin section shows a fine-grained ground-mass in which are developed phenocrysts of felspar and quartz. Much of the felspar is plagioclase, but it is so decomposed that the twinning striae are very difficult to make out. Some yellow-brown areas now largely made up of epidote represent the original coloured constituent. Magnetite is rather abundant.

The rock is probably a quartz porphyrite.

26. Lake Rogers.

A flesh-red granitic rock traversed by small veins of chlorite.

The thin section shows a crystalline granular admixture of orthoclase, microcline, plagioclase and quartz, with irregular scales and plates of chlorite, most of which has probably been derived from the decomposition of biotite. Granophyre is very abundant and characteristic.

27. Hottah lake.

A massive greenish-gray eruptive rock.

The thin section shows a rock composed chiefly of plagioclase and hornblende. The plagioclase has undergone advanced decomposition to saussurite forming an interlacing network of tabular crystals piercing the allotromorphic hornblende. Biotite and epidote also occur aggregated together in small masses.

Magnetite, probably titaniferous, likewise occurs.

28. North end of Lac Ste. Croix.

Granite porphyry.

The hand specimen shows a porphyritic rock with a dark-grayish ground-mass in which are embedded large phenocrysts of reddish felspar and much smaller individuals of grayish translucent quartz.

The thin section shows a comparatively coarse microgranitic ground-mass made up of quartz, orthoclase, plagioclase and a large amount of chlorite, and some ilmenite decomposed to leucoxene. Granophyre is very abundant and characteristic. In this are embedded large phenocrysts of microperthite and orthoclase and smaller decomposed individuals of plagioclase. Quartz in rounded dihexahedral crystals is also abundant.

29. North end of Lake Marian.

A dark-gray gneissic rock, evidently one of the more basic gneisses usually classified as Laurentian.

The thin section shows a rock made up chiefly of orthoclase, plagioclase, quartz and biotite. Much of the felspar is more or less turbid as a result of decomposition. The biotite is reddish-brown in colour and its marked parallel disposition gives the rock its very evident foliation.

30. North end of Lake Rogers.

A comparatively coarse-grained hornblendic rock with conspicuous deep-red individuals of felspar.

The thin section shows a quartz-mica diorite. The plagioclase has undergone advanced decomposition so that only in rare instances can the twinning lamellæ be distinguished. A clear mineral, probably quartz fills in the irregular interspaces. The hornblende is the green compact variety. The biotite has undergone considerable bleaching and chloritization. A little epidote and apatite are also present.

